

# ENERGY

# CONSERVATION CONTRACT

Students learn about saving energy by encouraging their families to conserve.



GRADE LEVEL

4-12

SUBJECT AREAS

Science

Social Studies

Math

Language Arts

## \$AVING ENERGY



## \$AVING MONEY

### NEED

2009-2010

Putting Energy into Education

NEED Project PO Box 10101 Manassas, VA 20108 1-800-875-5029 [www.NEED.org](http://www.NEED.org)

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## Teacher Advisory Board Vision Statement

### NEED Mission Statement

*The mission of the NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.*

*In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.*

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# TABLE OF CONTENTS

Correlations to National Science Standards .....	4
Teacher Guide .....	5
Extension Activities .....	6
Student Guide .....	7
Household Rating Guide .....	8
Energy Conservation Contract .....	12
Calculating Your Energy Savings .....	13
How Much Energy Did We Save? .....	14
Evaluation Form .....	15



# Correlations to National Science Standards

*(Bolded standards are emphasized in the unit.)*

## PRIMARY (K-4) STANDARD–F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

### 3. Types of Resources

- a. Resources are things that we get from the living and nonliving environment to meet the needs and wants of a population.
- b. Some resources are basic materials, such as air, water, and soil; some are produced from basic resources, such as food, fuel, and building materials; and some resources are nonmaterial, such as quiet places, beauty, security, and safety.
- c. **The supply of many resources is limited. If used, resources can be extended through recycling and decreased use.**

## INTERMEDIATE (5-8) STANDARD–E: SCIENCE AND TECHNOLOGY

### 2. Understandings about Science and Technology

- f. Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Risk is part of living in a highly technological world. Reducing risk often results in new technology.

## INTERMEDIATE STANDARD–F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

### 3. Natural Hazards

- c. Hazards can present personal and societal challenges because misidentifying the change or incorrectly estimating the rate and scale of change may result in either too little attention and significant human costs or too much cost for unneeded preventive measures.

### 4. Risks and Benefits

- d. Important personal and social decisions are made based on perceptions of benefits and risks.

## SECONDARY (9-12) STANDARD–F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

### 3. Natural Resources

- a. Human populations use resources in the environment to maintain and improve their existence.

### 5. Natural and Human-induced Hazards

- d. Natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and trade-offs of various hazards—ranging from those with minor risk to a few people to major catastrophes with major risk to many people.

# Teacher Guide

**TO EDUCATE STUDENTS, THEIR FAMILIES, AND COMMUNITIES ABOUT ENERGY CONSERVATION MEASURES & ENCOURAGE THEM TO SAVE ENERGY AT HOME.**

## BACKGROUND

Students discuss with their families the energy they use for everyday activities and educate them about energy-saving behaviors and methods, using the Household Rating Guide. For one month, family members are asked to make a conscious effort to reduce their energy use. When the one-month period is over, students and their families will again use the Guide to estimate how much energy they saved. Students are encouraged to ask family members to sign another contract for 12 months and display the contract at home as a reminder.

## TIME

Two to three 45-minute class periods over a one-month period, plus homework.

## MATERIALS

- Transparencies of pages 12, 13, and 14
- **Student Guide and Conservation Contract Forms**—one per student (page 7–13)

## PROCEDURE

### Step One—Preparation

Make one transparency of the **Energy Conservation Contract, Calculating Your Average Savings, and How Much Energy Did We Save?** (pages 12, 13, 14) to show students how to enter scores and do the math required on the forms.

### Step Two—Introduce Activity

Introduce the activity to your students. Give each student a copy of the **Student Guide, Household Rating Guide, Energy Conservation Contract, and Calculating Your Energy Savings** guide.

### Step Three—Explain How to Do the First Discussion/Rating

Explain how to conduct the first discussion with family members. Be sure students know how to calculate and enter the scores on the **Energy Conservation Contract** sheet—fill in a sample form on the transparency with the class. Give the students a set time—perhaps three days—to conduct their discussion. Students may leave the **Rating Guide** with their families, but must return the other forms. Emphasize to the students that they will need to use the other forms at the end of the month. Collect the forms after the allotted time.

### Step Four—Explain How to Do Second Discussion/Rating

At the end of the one-month contract period, distribute the forms again so that students can lead their families in the post-activity discussion and rating. Again, give the students a time period in which to complete the interviews and return the completed forms.

### Step Five—Tabulate All Contract Results

When all of the reports are in, it's time to calculate how much energy the participating households saved during the one-month period. Use the **How Much Energy Did We Save?** form (page 14) to complete this activity. Tell students to ask their families to sign the contract for an additional 12-month period and to display the contract prominently at home to encourage energy-saving behaviors.

# Extension Activities

Be sure to let everyone know how much energy your **ECC** project saved! Make a chart and publicize the results in the local newspaper, your school paper, and/or a PTA bulletin. Figure out how much energy the participating households would save in one year if they continue their energy-saving behaviors. Or figure out how much energy would be saved if two or three times as many households implemented the energy-saving behaviors.

Do you want to do a super **ECC** project? You can use these activities to build students' communication, writing, geography, or math skills. Examine the activities given below and pick one or more that fit your needs.

## **Press Conference (Skills: communication, writing)**

Do you want to involve the entire school in your **ECC** project? Consider holding a press conference to let everyone know what the project is all about.

## **Have a VIP (principal, mayor, or Congressman) sign an Energy Conservation Contract**

Brainstorm VIPs that the class might be able to enlist in your efforts by signing a contract.

## **Letters to VIPs (Skills: writing)**

Write a letter to your congressman or to the President. Explain what your class is doing to raise energy awareness in your community. Enclose the results of your efforts.

## **50 States Campaign (Skills: writing, geography)**

An interesting twist to this activity is getting contracts signed in all 50 states.

# Student Guide

Your task is to help your family learn how to save energy at home. You will discuss how families use energy at home, and teach them about energy conservation and efficiency technologies, techniques and behaviors. Using the **Household Rating Guide**, you will survey your family's current energy use. You will discuss the ratings in each category, commending them on scores of 4 or 5. Scores of 3 or below indicate areas where improvements can easily be made. Ask them to make a conscious effort to save energy for the next month by signing the **Energy Conservation Contract**.

When the one-month contract period is over, you will meet with your family and conduct a second survey to determine the new **Energy Conservation Rating** and calculate the amount of energy saved during the contract period. Encourage family members to continue energy-saving behaviors after the project is finished.

Your class will then tally the energy saved by all participating families during the period.

## Discussion #1

1. Gather your family members together and explain the goal of the project. Explain to them the importance of conserving energy and how most energy-saving changes are simple, easy to do and save money.
2. Show your family the **Household Rating Guide** and explain the rating levels of 0 to 5 on the first five sections. Ask them to rate their household energy use honestly as you go through each section. Explain that most households have low ratings (0, 1, or 2), so there's no need to be embarrassed. If different family members have different answers, agree on an average figure for each activity. Underline the family's ratings.
3. After you have finished the first five sections, explain that the last section (**Living Efficiently**) is a little different. It contains one-time or long-term actions that save energy and are rated with simple yes or no answers. The energy saved by each of these measures is significant.
4. At the end of the discussion, thank your family for participating and ask them to sign the **Pledge** in the box on the bottom of the contract. Leave the **Household Rating Guide** in a convenient place so that family members can review it.
5. Calculate the average score for each section on the back page and enter it in the **Rating Before** column on the **Energy Conservation Contract**.

## Discussion #2 (one month later)

1. Once again, go through the **Household Rating Guide** with your family to determine the new ratings in each section. Circle the family's ratings.

*NOTE: Since your family may not remember the rating from the first interview, they may give themselves a lower rating. In this case, tell them the first rating and ask if they have gotten better, worse, or are behaving the same in that category. If your family really believes they are doing less to save energy than before, record that number.*

2. Calculate the average score for each section on the back page and enter it in the **Rating After** column of the **Energy Conservation Contract**.
3. Calculate the Energy Conservation Units (ECUs) saved in each category and add them to find the **Monthly Total**. Calculate the Energy Equivalents in the second chart to show your family the equivalent savings. Congratulate your family on the energy they've saved! Ask your family to keep the **Household Rating Guide** with its energy-saving tips in a prominent place, but you must keep the **Energy Conservation Contract** so that your class can make a final report.
4. Encourage your family members to keep up their energy saving behaviors and to implement any recommendations in the **Living Efficiently** section to which the answer was no. Invite them to any follow-up activities planned at your school.

# HOUSEHOLD RATING GUIDE

## HOW TO RATE YOUR FAMILY'S ENERGY USE

How much energy does your family use every month? Are your family members aware of the energy they use? Do they know about ways to save energy at home by changing their actions and taking simple steps to make the house more energy efficient?

This guide can help your family save energy in six energy areas:

- **Home Heating and Cooling**
- **Household Appliances**
- **Water Heating**
- **Lighting**
- **Transportation**
- **Living Efficiently**

Start by finding your family's **Energy Conservation Rating**. First, read the statements in each energy section carefully. Decide how much or how little your family's energy use fits the statements and then rate your family's energy use by choosing a number from 0 to 5 for each statement in the first five categories.

For example, if your family never makes an effort to save energy in a category, choose 0. But if your family always makes an effort, choose 5. (If some members of your household are more energy conscious than others, choose the number you feel represents the average for your family.)

Please be honest with your responses. Don't be embarrassed if you give your family low ratings; most American households would receive ratings of 0, 1, or 2. The important thing is to honestly evaluate your current energy consumption and work to reduce it.

The Living Efficiently section deals with one time or long-term actions; those statements are rated with simple yes or no answers. The actions listed in this section reduce energy consumption significantly and are given more weight.

At the end of the contract period, you will be rated again on your family's energy use and any energy-saving improvements your household has made.

You should know the contract rating system gives some energy conservation behaviors more weight than others. Turning down the thermostat, for example, saves more energy than turning off a light.



# HOME HEATING & COOLING



- 1. We inspect windows and doors, and make repairs as necessary, to make sure they are airtight.**

Caulking and weatherstripping can deteriorate over time.

Never 0 1 2 3 4 5 Always

- 2. We inspect the ductwork to make sure there are no cracks or openings.**

Openings or cracks in the ducts can allow conditioned (heated or cooled) air to escape into the attic and crawl spaces.

Never 0 1 2 3 4 5 Always

- 3. We clean or replace system filters as recommended.**

Keeping filters clean will provide more efficient heating and cooling.

Never 0 1 2 3 4 5 Always

- 4. In winter, we dress warmly and set the thermostat at 68 degrees or lower during the day and 60 degrees or lower at night.**

If every U.S. home lowered the heat setting by six degrees, 570,000 barrels of oil would be saved per day.

Never 0 1 2 3 4 5 Always

- 5. In the summer, we dress lightly and set the thermostat at 78 degrees or higher.**

This temperature is considered the most comfortable for humans, if fans are used to circulate the air.

Never 0 1 2 3 4 5 Always

- 6. We keep windows and doors closed when the heating or air conditioning system is operating.**

Having windows and doors open makes your heating or air conditioning system work harder.

Never 0 1 2 3 4 5 Always

# WATER HEATING

- 1. The water heater thermostat is always set at 120 degrees.**

Most hot water heaters are set much higher than necessary. You can save up to 10 percent on your energy bill by setting the temperature at 120 degrees.

Never 0 1 2 3 4 5 Always

- 2. We inspect the insulation on our hot water tank and piping, and make repairs as necessary.**

Insulation can come loose or deteriorate over time.

Never 0 1 2 3 4 5 Always

- 3. We use cold water whenever hot water isn't necessary (washing clothes, rinsing dishes, running disposal).**

Using cold water saves energy and most tasks don't require hot water.

Never 0 1 2 3 4 5 Always

- 4. We take short showers and fill the tub with only the water we need.**

Short showers use less energy than baths.

Never 0 1 2 3 4 5 Always

- 5. We fill the sink to wash dishes rather than running the water and use the short cycle on the dishwasher.**

Running water to wash dishes and long dishwasher cycles use a lot of water and energy.

Never 0 1 2 3 4 5 Always



# HOUSEHOLD APPLIANCES

**1. We turn off appliances, such as TVs, when not in use.**

Many appliances continue to draw energy when they are in the off position; be aware of these.

Never 0 1 2 3 4 5 Always

**2. We preheat the oven for only five minutes or not at all.**

It also saves energy to cook several dishes at once to make maximum use of this concentrated heat.

Never 0 1 2 3 4 5 Always

**3. When baking, we keep the oven door closed rather than opening it often to look inside.**

An open oven door lets valuable heat escape; maintain the heat by keeping the door shut and use a timer.

Never 0 1 2 3 4 5 Always

**4. Whenever possible, we use a toaster oven or microwave instead of a regular oven.**

These smaller appliances save energy for most cooking jobs.

Never 0 1 2 3 4 5 Always

**5. We inspect refrigerator and freezer door seals often to make sure they are airtight.**

Insert a piece of paper halfway in the door. If you can pull the paper out easily, the seal is not airtight.

Never 0 1 2 3 4 5 Always

**6. We use the energy-saver feature on the dishwasher, allowing the dishes to air dry.**

Producing heat to dry dishes uses a lot of energy.

Never 0 1 2 3 4 5 Always



# LIGHTING

**1. We turn off indoor and outdoor lights when they are not needed.**

Many people leave lights on without thinking—wasting energy.

Never 0 1 2 3 4 5 Always

**2. We use natural lighting whenever we can by opening blinds/shades.**

Natural lighting is free to use.

Never 0 1 2 3 4 5 Always

**3. We use energy-efficient fluorescent lights in garages and work areas that need lots of light.**

A 40-watt fluorescent lamp provides 80 lumens per watt while a 60-watt incandescent provides only 15 lumens per watt. You save energy and get more light from fluorescents.

Never 0 1 2 3 4 5 Always

**4. We replace burned-out incandescent light bulbs with compact fluorescent bulbs.**

New compact fluorescent lights fit conventional light fixtures. They are expensive to buy, but last ten times longer and use one-fifth the energy of incandescent bulbs, saving you money and energy in the long run.

Never 0 1 2 3 4 5 Always

**5. We keep lamps and light fixtures clean because dirt absorbs light.**

Get the best use of lighting by dusting regularly.

Never 0 1 2 3 4 5 Always



## TRANSPORTATION



**1. We check tire pressure regularly and keep oil and air filters clean.**

Under-inflated tires decrease fuel economy by as much as one mile per gallon. Clogged filters waste gasoline.

Never 0 1 2 3 4 5 Always

**2. We have the car's engine tuned regularly.**

A well-tuned engine can improve gas mileage by as much as 10 percent.

Never 0 1 2 3 4 5 Always

**3. We use public transportation or carpool whenever we can.**

Using public transportation and carpooling saves on transportation fuel.

Never 0 1 2 3 4 5 Always

**4. We avoid unnecessary trips by planning carefully.**

The fewer trips you make, the less fuel you use.

Never 0 1 2 3 4 5 Always

**5. We do not exceed the speed limit and maintain a steady speed when driving.**

Driving faster than the speed limit uses more fuel. It's more efficient to keep an even speed.

Never 0 1 2 3 4 5 Always

**6. We do not let an automobile idle for more than one minute.**

Less gas is used to restart an engine than to idle for more than one minute.

Never 0 1 2 3 4 5 Always

## LIVING EFFICIENTLY



**1. We have had an energy audit of our house.**

Your local utility will send someone to your house to perform an audit and show you where your house is wasting energy and what you can do to correct it.

Yes No

**2. We have eliminated drafts around windows and doors with caulking and weatherstripping.**

Proper caulking and weatherstripping can cut fuel costs by up to 10 percent.

Yes No

**3. We have the proper amount of insulation in the attic and walls.**

If you need to add insulation, the cost will be returned to you in lower utility bills.

Yes No

**4. We have insulated our hot water tank and piping.**

A well-insulated tank can save \$10-20 in energy costs over a 12-month period.

Yes No

**5. We have low-flow shower heads.**

These easy-to-install devices save energy and provide adequate shower pressure.

Yes No

**6. When buying new appliances, we compare Energy Guide labels and buy energy efficient models.**

The most energy efficient new appliances cost a little more, but save money and energy over their operating life.

Yes No

**7. When purchasing vehicles, fuel mileage is one of our most important considerations.**

A fuel efficient vehicle can save thousands of dollars in fuel costs over the life of the vehicle.

Yes No

# The Energy Conservation Contract

Number in Household: \_\_\_\_\_

## Household Energy Conservation Rating

Energy Saving Measure	Rating After	— Rating Before	= Change	X ECU* Factor	= ECUs Saved
Heating & Cooling				X 10 ECU	=
Water Heating				X 5 ECU	=
Household Appliances				X 3 ECU	=
Lighting				X 2 ECU	=
Transportation				X 10 ECU	=
Living Efficiently Rating				X 50 ECU	=
Total Monthly Savings = Total ECUs Saved					TOTAL

\*ECU= Energy Conservation Unit - an average energy saving unit calculated by considering the many different appliances and fuels used by homes to accomplish the tasks. The actual amount of energy saved by an individual household is difficult to measure precisely, because it depends upon the age of the house, furnace, air conditioner, and appliances, and many other factors. Long-term monitoring of weather conditions and energy meters is the only method of determining actual energy savings in an individual residence.

Total ECUs Saved	Conversion	Energy Equivalent
	ECU X 100,000 BTUs	Btu
	ECU X 0.8 gallons of gas	gallon
	ECU X 1.0 therm natural gas	therm
	ECU X 10 kWh electricity	kWh

### ENERGY CONSERVATION PLEDGE

We, the members of this household, agree to make a sincere effort to save energy and to learn more about energy conservation and efficiency.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## CALCULATING YOUR AVERAGE SAVINGS

### BEFORE RATING:

**HEATING/COOLING:** Add the scores you underlined and divide the total by six. \_\_\_\_\_

**WATER HEATING:** Add the scores you underlined and divide the total by five. \_\_\_\_\_

**APPLIANCES:** Add the scores you underlined and divide the total by six. \_\_\_\_\_

**LIGHTING:** Add the scores you underlined and divide the total by five. \_\_\_\_\_

**TRANSPORTATION:** Add the scores you underlined and divide the total by six. \_\_\_\_\_

**LIVING EFFICIENTLY:** Add the number of yes answers. \_\_\_\_\_

*Record these average ratings on the **Energy Conservation Contract** in the **Rating Before** column.*

### AFTER RATING:

**HEATING/COOLING:** Add the scores you circled and divide the total by six. \_\_\_\_\_

**WATER HEATING:** Add the scores you circled and divide the total by five. \_\_\_\_\_

**APPLIANCES:** Add the scores you circled and divide the total by six. \_\_\_\_\_

**LIGHTING:** Add the scores you circled and divide the total by five. \_\_\_\_\_

**TRANSPORTATION:** Add the scores you underlined and divide the total by six. \_\_\_\_\_

**LIVING EFFICIENTLY:** Add the number of yes answers. \_\_\_\_\_

*Record these average ratings on the **Energy Conservation Contract** in the **Rating After** column.*

# HOW MUCH ENERGY DID WE SAVE?

How many families signed ECC contracts?

Indicate the total number of ECUs saved in each of the following categories:

Heating/Cooling \_\_\_\_\_

Water Heating \_\_\_\_\_

Appliance Use \_\_\_\_\_

Lighting \_\_\_\_\_

Transportation \_\_\_\_\_

Living Efficiently \_\_\_\_\_

Total ECUs saved in all categories (*add above numbers for total*) \_\_\_\_\_

## ENERGY PROJECTIONS

How much energy would the families save if they continue the energy-saving measures for one year?

\_\_\_\_\_

How much energy would your community save if the following number of homes practiced the measures outlined in the Energy Rating Guide?

500 \_\_\_\_\_

1000 \_\_\_\_\_

5000 \_\_\_\_\_

# ENERGY CONSERVATION CONTRACT

## Evaluation Form

State: \_\_\_\_\_ Grade Level: \_\_\_\_\_ Number of Students: \_\_\_\_\_

- |  |     |    |
|--|-----|----|
| 1. Did you conduct the entire activity?                        | Yes | No |
| 2. Were the instructions clear and easy to follow?             | Yes | No |
| 3. Did the activity meet your academic objectives?             | Yes | No |
| 4. Was the activity age appropriate?                           | Yes | No |
| 5. Were the allotted times sufficient to conduct the activity? | Yes | No |
| 6. Was the activity easy to use?                               | Yes | No |
| 7. Was the preparation required acceptable for the activity?   | Yes | No |
| 8. Were the students interested and motivated?                 | Yes | No |
| 9. Was the energy knowledge content age appropriate?           | Yes | No |
| 10. Would you use the activity again?                          | Yes | No |

How would you rate the activity overall (excellent, good, fair, poor)?

How would your students rate the activity overall (excellent, good, fair, poor)?

What would make the activity more useful to you?

Other Comments:

Please fax or mail to:  
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**PO Box 10101**  
**Manassas, VA 20108**  
**FAX: 1-800-847-1820**

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 Council  
 Kentucky River Properties LLC  
 Keyspan  
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 Lenfest Foundation  
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